REMARKS

Reconsideration and allowance are respectfully requested.

Claims 26-34 and 40-52 are pending. The amendments are fully supported by the original disclosure and, thus, no new matter is added by their entry. Claims 26 and 48 require a precursor fluorinated organosilane amount of "up to 25%" or "in the range from 10% to 25%" of the co-polymerization mixture, respectively. Support may be found in Table 1 and at page 12, line 32, to page 13, line 1, of the specification, describing use of catalysts from C3F-10 (10%) to C3F-25 (25%). The limitation "wherein the molar ratio among the total silica (Si), as fluorinated organosilane + silane, the amount of cosolvent, and the amount of water is in the range from 1:4:4 to 1:8:8" incorporated into the independent claims was recited in the previously presented claim 34; the particular ratio of 1:8:4 is recited in the present claim 34. New claims 49-52 are similar to claims 26, 40, 48 and 45 with the additional requirement that the amount of fluorinated organosilane is in the range from 10% to 25%.

Cancellation of claims 36-39 moots the Section 101 rejection against them. They are canceled without prejudice or disclaimer because they are redundant in view of the pending process claims. Thus, cancellation does not surrender any scope of protection.

Information Disclosure Statement

Form PTO-1449 listing documents for the Examiner's consideration is attached. Copies of the listed documents and the fee required under 37 CFR § 1.97(c) are also attached. Should the fee be missing or inadequate, please charge the deficiency to our Deposit Account No. 14-1140 under Order No. 4161-16.

As provided by 37 CFR §§ 1.97(g) and (h), the Examiner should not infer that this information and the listed documents are prior art merely because they are submitted for consideration. Further, Applicants do not represent that the claimed subject matter was searched or that this statement encompasses all possible material information.

Consideration of the foregoing and attachments, as well as return of an initialed copy of Form PTO-1449 per M.P.E.P. § 609 to confirm the Examiner's consideration of this information are earnestly solicited.

Claim Objections

Claims 27-28 are amended to correct a misspelling and to recite only a particular type of metal alkoxide, respectively. The limitation "fluorinated organosilane" is deleted from claim 28 because it is not required for patentability in this dependent claim.

Withdrawal of the objections is requested.

35 U.S.C. 112 – Definiteness

Claims 28, 30-31, 34, 42 and 45-47 were rejected under Section 112, second paragraph, as allegedly "indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention." Applicants traverse.

In claim 28, only the phrase "fluorinated silica alkoxide" is recited because it is a species of the genus fluorinated organosilane. Contrary to the allegation on page 2 of the Office Action, fluorinated silica alkoxide is definite and *is* a phrase that is commonly used in the art. For example, the attached Ciriminna et al. (Adv. Synth. Catal. 346:231-236, 2004) shows that use of "fluorinated silica" is known in the art. The term "alkoxide" means that the hydroxyl (-OH) groups of silica are protected as alkoxy (-OR) groups. Therefore, Applicants submit that the meaning of "fluorinated silica alkoxide" to persons skilled in the art, such as a chemist.

Claim 34 is amended to clarify that the cosolvent is MeOH (cf. claim 49 wherein the solvent comprises methanol).

In claim 42, the partial pressure of the oxygen is kept at "about" 1 bar. As demonstrated by Applicants in their specification, this term has a defined meaning and its legal use is known to prevent a potential infringer from avoiding literal infringement simply by making a minor modification.

Claim 35 is canceled because it has the same scope as the present claim 44. Similarly, claims 36-39 are canceled because they are redundant in view of the present claims. Thus, their cancellation does not surrender any scope of protection.

Applicants request withdrawal of the Section 112, second paragraph, rejection because the pending claims are clear and definite.

35 U.S.C. 103 – Nonobviousness

A claimed invention is unpatentable if the differences between it and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art. *In re Kahn*, 78 USPQ2d 1329, 1334 (Fed. Cir. 2006) citing *Graham v. John Deere*, 148 USPQ 459 (1966). The *Graham* analysis needs to be made explicitly. *KSR Int'l v. Teleflex*, 82 USPQ2d 1385, 1396 (2007). It requires findings of fact and a rational basis for combining the prior art disclosures to produce the claimed invention. See id. ("Often, it will be necessary for a court to look to interrelated teachings of multiple patents . . . and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue"). The use of hindsight reasoning is impermissible. See id. at 1397 ("A factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon ex post reasoning"). Thus, a prima facie case of obviousness requires "some rationale, articulation, or reasoned basis to explain why the conclusion of obviousness is correct." *Kahn* at 1335; see *KSR* at 1396. An inquiry should be made as to "whether the improvement is more than the predictable use of prior art elements according to their established functions." Id. But a claim that is directed to a combination of prior art elements "is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." Id. Finally, a determination of prima facie obviousness requires a reasonable expectation of success. See *In re Rinehart*, 189 USPQ 143, 148 (C.C.P.A. 1976).

The invention as presently claimed, and the advantages that are obtained therefrom, are summarized below before addressing the specific obviousness rejections.

The present process for production of a nanohybrid sol-gel material as presently claimed (see claims 26 and 48) provides a fluorinated catalyst material that offers indisputable advantages over non-fluorinated material, such as disclosed in Ciriminna et al. (Adv. Synth. Catal. 345:1261-1267, 2003) and Pagliaro et al. (Tetrahedron Lett. 42: 4511-4514, 2001). In particular, in comparison to the non-fluorinated material, the fluori-

nated material of Applicants' claimed invention exhibits different and unexpected catalysis kinetics, which are characterized by an initial induction stage followed by a faster linear stage up to complete conversion of the substrate. This is clearly shown and illustrated in Fig. 1 of the present specification. Therefore, the alleged equivalence between the two materials, upon which the following obviousness objections rely, would not have been recognized by one of ordinary skill in the art.

The improved catalytic properties of the material of the claimed invention is the result of precise balancing of selected operative conditions of the production process (see claim 26), which include a large amount of organic cosolvent in the reaction medium (see page 13, lines 14-25, of the specification) and moderate fluorination of the silane copolymer. This contribution of a selected degree of fluorination is clearly shown in Table 2 on page 12 of the specification and explained in subsequent paragraphs. The unexpected properties of catalyst material produced by the claimed processes must be considered in determining patentability. See *Kahn* at 1335 and *KSR* at 1396 for proper analysis of obviousness under Section 103(a).

But the improved activity of catalysts used in Applicants' claimed process is not merely alleged by the inventors in their specification. This unexpected improvement was subsequently confirmed in peer-reviewed publications authored by the same inventors and attached herewith: Ciriminna et al. (Adv. Synth. Catal., 346:231-236, 2004) and Fidalgo et al. (Physical Chemistry Chemical Physics, 10:2026-2032, 2008).

Ciriminna (2004) describes the same catalytic material of the present invention, and confirms the importance of moderate (e.g., 10%) fluorination for the catalyst's unexpected properties. Moreover in the first paragraph under "Results and Discussion" at page 232, the authors confirm the importance in sol-gel co-polycopolymerization of "a high amount of cosolvent (Si:MeOH = 1:8), which was recently found to be crucial in promoting the reactivity of analogous doped ormosils in $scCO_2$" (emphasis added).

Fidalgo confirms the excellent catalytic properties of the material *FluoRuGel* and, in particular, those of fluorinated compounds C_3F_3 and C_8F_{13}, which are two preferred compounds of the present invention. Under footnote 6 of Fidalgo, the authors confirm the novel and unexpected reaction kinetics of the catalytic material, and reiterate that

such properties are the result of the selected conditions in the production process of that catalytic material (see Abstract). The relevant parameters of the claimed process are the moderate degree of fluorination and the length of the fluoroalkyl chain linked to the silica network, which determines the hydrophilic-hydrophobic balance of the matrix.

Last, but not least, Fidalgo's results are considered so innovative by the expert peer reviewer that this publication was highlighted on the cover page of the Volume 10, No. 15 issue of *Physical Chemistry Chemical Physics*, as shown in the image attached at the end of the reference copy. The very fact that the editors awarded this work, which is the subject matter of the present application, with such an honor in itself contradicts the obviousness determination in the pending Office Action.

Claims 26-47 were rejected under Section 103(a) as allegedly unpatentable over Koya et al. (U.S. Patent 6,284,696) in view of Ciriminna et al. (Adv. Synth. Catal. 345: 1261-1267, 2003) OR Ciriminna in view of Koya. Applicants traverse because Ciriminna is not prior art to their claimed invention.

The Examiner cited page 1262 of Ciriminna on page 4 of the Office Action. But this publication is not prior art because it was published on *November 19, 2003* (see "2003-11-19" date listed in the attached search report WO 2005/042155 A3) after the earliest priority date of this application (i.e., October 29, 2003). Therefore, the obviousness rejections should be withdrawn because they are based on faulty evidence.

In any case, the combination of disclosures proposed by the Examiner does not establish that it would have been prima facie obvious to make the presently claimed process as discussed below.

As was recognized by the Examiner, Koya's disclosure differs from Applicants' production process (see the present claim 26) and material produced therebyl (see the present claims 44-48) because Koya's silane sieves, although indicated as a suitable catalyst support, do not comprise the catalyst of the present invention TPAP. On the other hand, material described in Ciriminna (and in Pagliaro cited below), although comprising TPAP, does not comprise fluorinated organosilane. One of ordinary skill would not have found it to be obvious to combine Koya with either Ciriminna or Pagliaro as proposed in the Office Action and to arrive at Applicants' claimed invention.

Koya disclosed many types of co-polymers and the fluorinated molecular sieves described in Example 12 are only one of the many embodiments envisaged. The cited patent fails to recognize any difference between non-fluorinated and fluorinated material and, more importantly, to recognize these advantages in terms of the improved catalytic properties achieved by fluorination of the material. Therefore, it would not have been obvious for one of ordinary skill in the art to select the sole fluorinated sieve of Example 12 from among the many other non-fluorinated materials disclosed in Koya and to integrate it into the sieve of the TPAP catalyst disclosed by Ciriminna or by Pagliaro.

Neither would it have been obvious to arrive at Applicants' claimed invention from the water repellency of the fluorinated material in Example 12, as apparently alleged by the Examiner. Water repellency is a property shared by nearly all molecular sieves that are described by Koya, independent of their content of fluorine, as showed by Examples 1 and 7-20. Moreover, all of the other parameters of the powdered material obtained by Koya, such as specific surface and pore size appear to be completely unaffected by fluorination of the material. In other words, the chemical and physical features of the fluorinated material in Example 12 are the same as those of non-fluorinated materials, such as those in Example 1.

Even accepting that one of ordinary skill, without any reasonable motivation, would have turned his or her attention to the fluorinated material of Example 12, that person would have remained unaware of other aspects essential for the achievement of the improved catalytic properties of the material taught in the present specification. The first aspect is the importance of a moderate degree of fluorination. In fact, as shown in Table 2 of Applicants' specification, an increase of fluorination beyond a certain value (25%) results in a decreased in specific-surface-area and porosity, with a consequent decrease of the catalytic properties.

Equally, Koya failed to recognize the importance of a high amount of organic co-solvent in the co-polymerization reaction medium. In Example 1 of Koya, the ratio of Si: cosolvent:H_2O is 1:2:2.5, while in Example 12 this ratio is 1:1.9:2.4. Thus, in any case, the ratio of Si:co-solvent is about 2 in Koya (versus the requirement from 4 to 8 for the present claim 26) and with an excess of water as compared to the organic co-solvent.

Lastly, the co-solvent according to all of Koya's 20 examples is always ethanol instead of methanol as in some embodiments of Applicants' claimed invention (see dependent claims 34, 48 and 50).

In conclusion, relying on Koya's disclosure, one of ordinary skill would not have arrived at the production process of claim 26 (and claims dependent thereon) or the material of claim 44 (and claims dependent thereon) because he or she would not have found it obvious to select the fluorinated molecular sieve of Example 12 as a support for the specific TPAP catalyst of Ciriminna (and in Pagliaro cited below) with a reasonable expectation of success. In fact, Koya failed to identify an advantage to selecting a fluorinated material instead of a non-fluorinated material. Further, one of ordinary skill would not have found it obvious to modify the reaction conditions indicated in Example 12 to arrive at Applicants' claimed production process.

Claims 26-35 and 44-47 were rejected under Section 103(a) as allegedly unpatentable over Koya et al. (U.S. Patent 6,248,696) in view of Pagliaro et al. (Tetrahedron Lett. 42:4511-4514, 2001) OR Pagliaro in view of Koya. Applicants traverse because, as already discussed above, it would not have been obvious to combine Koya and Pagliaro and to make the presently claimed invention as alleged in the Office Action.

This Office Action fails to establish the prima facie obviousness of the presently claimed invention because the Examiner's arguments are mainly based on the alleged equivalence of the non-fluorinated material disclosed in Pagliaro (or Ciriminna) and the fluorinated material used in Applicants' claimed invention. This alleged equivalence, however, is refuted by the results of the comparative results shown in Fig. 1 of Applicants' specification, as well as the post-filing results published by Ciriminna (2004) and Fidalgo that were discussed above.

One of ordinary skill in the art would not have found it obvious to integrate the catalyst TPAP into the specific material of Koya's Example 12 for the simple reason that Koya failed to recognize any advantage in using a fluorinated material instead of any one of the many non-fluorinated sieves having exactly the same chemical and physical properties. Additionally, one of ordinary skill would not have had a reasonable expectation of success to modify the conditions of the process disclosed in Example 12 to

obtaining a highly efficient catalyst with the improved properties shown by the present inventors.

Having shown that Applicants' claimed process and catalysts produced thereby are patentable over the documents cited by the Examiner, the process of catalytic oxidation according to claims 40-43 using the same catalytic material is also patentable.

Withdrawal of the Section 103 rejections is requested because the claims would not have been obvious to one of ordinary skill in the art when this invention was made.

Conclusion

Having fully responded to the pending Office Action, Applicants submit that the claims are in condition for allowance and earnestly solicit an early Notice to that effect. The Examiner is invited to contact the undersigned if additional information is required.

Respectfully submitted,

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